Implementing DoDAF and UAF

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OCTOBER 25, 2018



Agenda

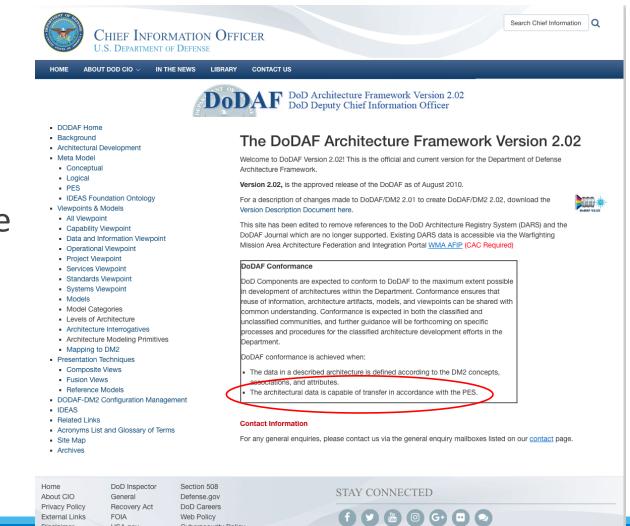
- What Is DoDAF Today?
- How Does UAF Expand on DoDAF?
- What Are the Strengths and Weaknesses of these Frameworks?
- How Does Systems Engineering Support these Frameworks?
- How Can We Implement these Frameworks?

DoDAF Today

Disclaimer

USA.gov No FEAR Act

- A website
- Link to PDF, which may be out of date
- DoDAF is integral to the DoD Acquisition System through the JCIDS policy
 - Different views required at different points in the lifecycle
- Conformance requires Physical Exchange Specification (PES)



Cybersecurity Policy

Contact Us

DoDAF Today

- Viewpoints: collections of views
- Hierarchy from capability level to systems
- Different groups responsible for different viewpoints
 - e.g., Operations –
 Capability and Operational Views

Overarching spects of architecture All Viewpoint context that relate to all models

late the data relationships and alignment structures architecture content

Articulate the data relationships and alignment structures Data and Information Viewpoint in the

Articulate applicable Operational, Business, Technical, and Industry policy, standards, guidance, constraints, and forecasts

Standards Viewpoint

Capability Viewpoint Articulate the capability requirement, delivery timing, and deployed capability

Operational Viewpoint

Articulate operational scenarios, processes, activities & requirements

Services Viewpoint

Articulate the performers, activities, services, and their exchanges providing for, or supporting, DoD functions

Systems Viewpoint

Articulate the legacy systems or independent systems, their composition, interconnectivity, and context providing for, or supporting, DoD functions

Describes the requirements and the various projects being implemented; Details lependencies relationships between operational and capability between capability management Project Viewpoint and the Defense

Acquisition System process

DoDAF Today

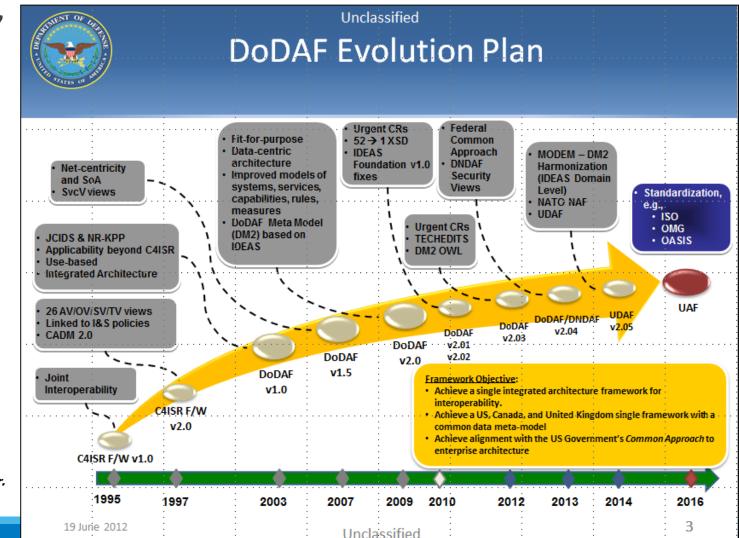
- Collections of models to make the products
- Descriptions of each product
- No templates, only suggested diagram types
- Does not include "fitfor-purpose" views

AII VP	AV-1	Overview and Summary Information	Describes a Project's Visions, Goals, Objectives, Plans, Activities, Events, Conditions, Measures, Effects (Outcomes), and produced objects				
All	AV-2	Integrated Dictionary	Architecture data repository with definitions of all terms used throughout the architecture data and presentations				
	CV-1	Vision	Overall vision for transformational endeavors, provides a strategic context for the capabilities described, and provides a high-level scope				
Int	CV-2	Capability Taxonomy	 A hierarchy of capabilities specifies all the capabilities that are referenced throughout one or more architectures Planned achievement of capability at different points in time o during specific periods of time Dependencies between planned capabilities and defines logica groupings of capabilities 				
ewpoi	CV-3	Capability Phasing					
ty Vie	CV-4	Capability Dependences					
Capability Viewpoint	CV-5	Capability to Organizational Development Mapping	The fulfillment of capability requirements shows the planne capability deployment and interconnection for a particular Capability Phase				
	CV-6	Capability to Operational Activities Mapping	Mapping between the capabilities required and the operational activities that those capabilities support				
	CV-7	Capability to Services Mapping	Mapping between capabilities and the services that these capabilities enable				
٩	DIV-1	Conceptual Data Model	Required High level data concepts and their relationships				
and Info \	DIV-2	Logical Data Model	Documentation of the data requirements and structural business process rules (In DoDAF V1.5, this was the OV-7)				
Data an	DIV-3	Physical Data Model	Physical implementation of the Logical Data Model entities, e.g., message formats, file structures, physical schema (In DoDAF V1.5, this was the SV-11)				

DoDAF Today (or Tomorrow?)

- Last published "roadmap" from Walt Okon
- DoDAF was frozen at the 2.02 version
- Unified Architecture Framework (UAF) is intended to replace DoDAF
- Not clear how DoD policy is viewing UAF

From "DoD Architectures and Systems Engineering Integration" presentation by Mr. Walt Okon at NDIA Systems Engineering Conference, October 2012



How Does UAF Expand on DoDAF?

- UAF integrates views from DoDAF, MoDAF, and NAF
- It is based on the Unified Profile for DoDAF and MoDAF (UPDM)
- UPDM is heavily influenced by SysML

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OF MALES OBJECT MANAGEMENT GROUP®	RESOURCE HUB 🗵	OMG SPECIFICATIONS ~	PROGRAMS ~	MEMBERSHIP –	MEMBERS AREA ~
UNIFIED ARCHITECTURE FRAMEWORK® (UAF®)	I			UAF • POP	ULAR STANDARDS + HOME

ENHANCE SYSTEM INTEROPERABILITY



The Unified Architecture Framework® (UAF®) is based on the Unified Profile for DoDAF and MODAF™ (UPDM™). UAF defines ways of representing an enterprise architecture that enables stakeholders to focus on specific areas of interest in the enterprise while retaining sight of the big picture. UAF meets the specific business, operational and systems-of-systems integration needs of commercial and industrial enterprises as well as the U.S. Department of Defense (DoD), the UK Ministry of Defence (MOD), the North Atlantic Treaty Organization (NATO) and other defense organizations.

UAF was initially developed as UPDM 3.0 in response to needs from the UML®/SysML® and military communities to develop standardized and consistent enterprise architectures based on the U.S. Department of Defense Architecture Framework (DoDAF) and the UK Ministry of Defence Architecture Framework (MODAF). Requirements were derived from both military frameworks as well as the NAF (NATO Architecture Framework). When these requirements were combined with requirements from the business sector (because 90% of concepts and themes captured in the military frameworks are equally applicable in the commercial domains), UAF, as a commercial framework that supports the needs of the commercial sector as well as the military, was born. Participants included a broad spectrum of interested parties, covering industry, tool vendors, and end users as well as representatives of the DoD and MOD.

VALUE PROPOSITION

Because of increasing complexity and rising costs, it is important to ensure that systems that are being developed can talk to each other and meet the overarching capabilities that they were intended to achieve. UAF architecture models provide a means to develop an understanding of the complex relationships that exist between organizations, systems, and systems-of-systems and enable the analysis of these systems to ensure that they meet the expectations of the user community.

- UAF supports current DoDAF/MODAF/NAF requirements and can evolve to meet future needs:
 - produce standard DoDAF/MODAF/NAF products as well as commercial extensions
 - leverage cross-industry, standards-based approaches (e.g., MDA, UML, SysML) to enhance tool and architecture data interoperability
 - MDA foundation enables UAF to evolve with DoDAF v2 and beyond (i.e,. security, human factors)
 - UAF is methodology-agnostic (structured, OO, etc.)
- UAF provides a set of rules to enable users to create consistent enterprise architectures (as models) based on generic enterprise and system concepts with rich semantics. These models then become the repositories from which various views can be extracted.

UAF Expands Number of Viewpoints and Views

- 10 viewpoints (rows)
 Resources, Security, Personnel
- 11 "visualizations" (columns)
- Also includes "Dictionary," Summary & Overview, and Requirements
- Not clear why items, such as operational and security traceability, are missing from table
- Is Security a separate viewpoint or is it embedded in others?

	Taxonomy Tx	Structure Sr	Connectivity Cn	Processes Pr	States St	Interaction Scenarios Is	Information If	Parameters Pm	Constraints Ct	Roadmap Rm	Traceability Tr
Metadata Md	Metadata Taxonomy Md-Tx	Architecture Viewpoints ⁸ Md-Sr	Metadata Connectivity Md-Cn	Metadata Processes ⁸ Md-Pr		-			Metadata Constraints ^a Md-Ct		Metadata Traceability Md-Tr
Strategic St	Strategic Taxonomy St-Tx	Strategic Structure St-Sr	Strategic Connectivity St-Cn		Strategic States St-St				Strategic Constraints St-Ct	Strategic Deployment, St-Rm Strategic Phasing St-Rm	Strategic Traceability St-Tr
perational Op	Operational Taxonomy Op-Tx	Operational Structure Op-Sr	Operational Connectivity Op-Cn	Operational Processes Op-Pr	Operational States Op-St	Operational Interaction Scenarios Op-ls			Operational Constraints Op-Ct		
Services Sv	Service Taxonomy Sv-Tx	Service Structure Sv-Sr	Service Connectivity Sv-Cn	Service Processes Sv-Pr	Service States Sv-St	Service Interaction Scenarios Sv-Is	Conceptual Data Model,	Environment Pm-En	Service Constraints Sv-Ct	Service Roadmap Sv-Rm	Service Traceability Sv-Tr
Personnel Pr	Personnel Taxonomy Pr-Tx	Personnel Structure Pr-Sr	Personnel Connectivity Pr-Cn	Personnel Processes Pr-Pr	Personnel States Pr-St	Personnel Interaction Scenarios Pr-Is	Logical Data Model,		Competence, Drivers, Performance Pr-Ct	Personnel Availability, Personnel Evolution, Personnel Forecast Pr-Rm	Personnel Traceability Pr-Tr
Resources Rs	Resource Taxonomy Rs-Tx	Resource Structure Rs-Sr	Resource Connectivity Rs-Cn	Resource Processes Rs-Pr	Resource States Rs-St	Resource Interaction Scenarios Rs-Is	Physical schema, real world results	Measurements Pm-Me	Resource Constraints Rs-Ct	Resource evolution, Resource forecast Rs-Rm	Resource Traceability Rs-Tr
Security Sc	Security Taxonomy Sc-Tx	Security Structure Sc-Sr	Security Connectivity Sc-Cn	Security Processes Sc-Pr					Security Constraints Sc-Ct		
Projects Pj	Project Taxonomy Pj-Tx	Project Structure Pj-Sr	Project Connectivity Pj-Cn	Project Activity					-	Project Roadmap Pj-Rm	Project Traceability Pj-Tr
itandards Sd	Standard Taxonomy Sd-Tx	Standards Structure Sd-Sr								Standards Roadmap Sr-Rm	Standards Traceability Sr-Tr
Actuals tesources Ar		Actual Resources Structure, Ar-Sr	Actual Resources Connectivity, Ar-Cn		Simulation ^b				Parametric Execution/ Evaluation ^b		
					Di	ctionary * Dc					
						y & Overview Sr	mOv				
					Rec	quirements Rq					

A new periodic table or Tower of Babel?

UAF to DoDAF Mapping

- Table 2.1 in the "Unified Architecture Framework (UAF)Traceability between Framework Views and Elements Version 1.0 - Appendix B (Informative)" provides a complete mapping between UAF and DoDAF
- Other mappings to MODAF, NAF, and DNDAF are also available in this document
- Unfortunately, this table does not include the UAF designators (e.g., Dc for the Dictionary, Op-Cn for Operational Connectivity), but you can add them yourself quickly

UAF Viewpoint Name	DoDAF 2.02	DoDAF 2.02 Long Name		
Actual Resource Connectivity	Combination of OV-4/SV-1.2	Actual Organisational Relationships		
		Systems interface description, Systems resource flow description (IBD, Parametrics)		
Actual Resource Structure	OV-4	Actual Organisational Relationships (IBD, Parametrics)		
Dictionary	AV-2	Integrated Dictionary		
Information Model	DIV-1/DIV-2/DIV-3	Conceptual Data Model/Logical Data Model/ Physical Data Model		
Operational Connectivity	OV-3	Operational Resource Flow Matrix		
Operational Constraints	OV-6a	Operational Rules Model		
Operational Interaction Scenario	OV-6c	Event-Trace Description		
Operational Processes	OV-5a/OV-5b	Operational Activity Decomposition Tree/Operational Activity Model		
Operational States	OV-6b	State Transition Description		
Operational Structure	OV-1, OV-2	High-level Operational Concept Graphic (Structured version), Operational Resource Flow Description (IBD)		
Operational Taxonomy	OV-1, OV-2	High-level Operational Concept Graphic (Structured version), Operational Resource Flow Description (IBD)		
Operational Traceability	-			
Parameters Environment	-			

Table 2.1 - UAF 1.0 to DoDAF 2.02 Mapping

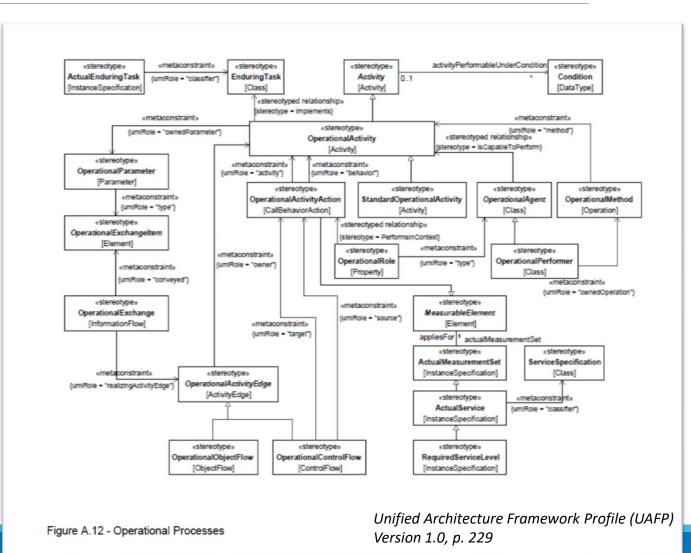
Overlay of DoDAF with UAF

- Made some adjustments from suggested ones in the standard (e.g., OV-5a is clearly a type of taxonomy or decomposition of the higher levels of information, not a process)
- Not clear that all of these fit well
- What do these products look like according to the UAF specification?

	Taxonomy Tx	Structure Sr	Connectivity Cn	Processes Pr		Interaction Scenarios Is	Information If	Parameters Pm	Constraints Ct	Roadmap Rm	Traceability Tr
Metadata Md	Metadata Taxonomy Md-Tx	Architecture Viewpoints ^a Md-Sr	Metadata Connectivity Md-Cn	Metadata Processes ^a Md-Pr					Metadata Constraints ^a Md-Ct		Metadata Traceability Md-Tr
Strategic St	Strategic Taxonomy St-Tx CV-2	Strategic Structure St-Sr CV-1	Strategic Connectivity St-Cn CV-4	-	Strategic States St-St CV-1				Strategic Constraints St-Ct	Strategic Deployment, CVM5 Strategic Phasing GVM3	Strategic Traceability St-Tr CV-6
Operational Op	operational Taxonomy OV-5a	Operational Structure OV-1/2	Operational Connectivity	Operational Processes OV-5b	operational States	Operational Interaction Scenarios			Operational Constraints		
Services Sv	Service Taxonomy VCV ⁵ 2 ⁻ 1x/2?	Service Structure SvcV-1/2	Service Connectivity SVCV-3/6	Service Processes Sv℃V-4	Service States SvcV-10b	Service Interaction Scenarios SVCV-ts100		Environment Pm-En	Service Constraints	Service Roadmap Sv-Rm SVCV-9	CV-7 Service Traceability SVCV-5
Personnel Pr	OV-4 Personnel Taxonomy Pr-Tx	OV-4 Personnel Structure Pr-Sr	OV-4 Personnel Connectivity Pr-Cn SV-6	Personnel Processes Pr-Pr SV-4	Personnel States Pr-St	Personnel Interaction Scenarios Pr-Is SV-10C	DIV-1 Logical Data Model, DIV-2		OV-4? Competence, Drivers, Performan Pr-Ct SV-10a?	Personnel Availapity_2 Personnel Forecast Pr-RSV-9	Personnel Traceability Pr-Tr SV-5a/b
Resources Rs	Resource Taxonomy	Resource Structure SV ^R =1/2	Resource Connectivity SV ^{Rs-Sn} /6	Resource Processes SV-4	Resource States Rs-St SV-10b	Resource Interaction Scenarios SVRs1sOC	Physical schema, real world results	Measurements Pm-Me	Resource Constraints SV-10a	Resource esview Resource forecast Rs-RSV-9	Resource Traceability SV-57a/b
Security Sc	Taxonomy Sc-Tx	Security Structure Sc-Sr	Security Connectivity Sc-Cn	Security Processes Sc-Pr			DIV-3	SV-7	Security Constraints Sc-Ct		
Projects Pj	Project Taxonomy PAVTx1	Project Structure ₽ ⁱ ∛-1	Project Connectivity	Project Activity PJ-Pr						Project Roadmap	Project Traceability ₽₩-₹3
Standards Sd	Standard Taxonomy SterV-1	Standards Structure Sterv/-1								Standards Roadmap	Standards Traceability StoV-1
Actuals Resources Ar		Actual Resources Structure, Ar-Sr	Actual Resources Connectivity, Ar-Cn		Simulation ^b				Parametric Execution/ Evaluation ^b		-
						ctionary * Dc	AV-2				
						v & Overview Sn Juirements Rg	10v AV-1/0	V-1			

Example Product Specification: Operational Processes (Op-Pr)

- "The UAF Profile uses an enhanced standard notation to represent metaconstraints graphically in the UAF profile diagrams to improve readability of the UAF Profile specification and overcome limitations of being unable to visualize constraints diagrammatically in UML"
- Does this make sense to you?
- Does this make any sense to your customer or other domain engineers?
- You absolutely need a tool to implement this for you



But that means I'm completely dependent on the tool!

What are the Strengths and Weaknesses of These Frameworks?

Strengths

- They both provide a formal way to specify products
- They are both well defined
- They both cover a lot of the information needed by systems engineers
- UAF includes Requirements specifically

Weaknesses

- Highly dependent on tool implementations
- Limited product set
- Complex set of diagrams
- UAF separates out "security" views
- Limited program management views (e.g., no risk or cost views called out)
- Limited acceptance outside SE community

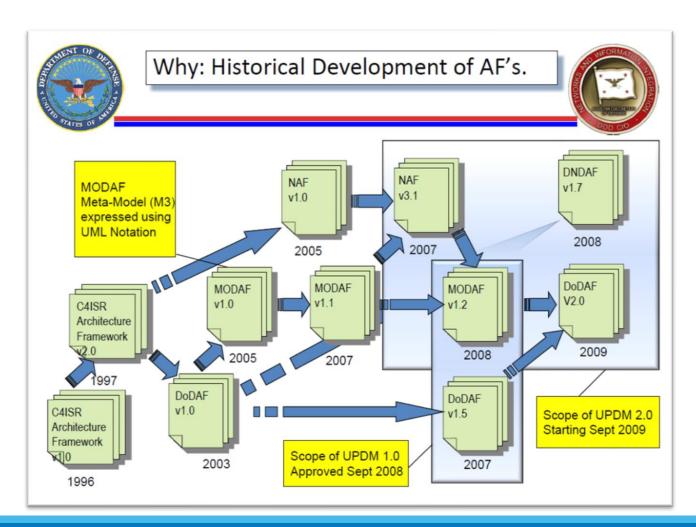
Can We Simplify UAF to Make It More Understandable to Others?

- If we recognize that the columns are really mainly types of diagrams or information, its fairly easy to map other languages or ontologies to it
- For example, Lifecycle Modeling Language (LML) provides such an ontology/diagram set
- Types are used in LML to distinguish the different Viewpoints – Innoslate[®] uses labels to implement types

		Hierarchy	Asset	Asset	Action	State	Action	Class	Charac	cteristic/	Timeline	Spider
_		Diagram	Diagram	Diagram	gram Diagram Diagram Diagram Measure Class		ire Class	Diagram	Diagram			
		Taxonomy Tx	Structure Sr	Connectivity Cn	Processes Pr		Interaction Scenarios Is	Information If	Parameters Pm	Constraints Ct	Roadmap Rm	Traceability Tr
	rtadata Md	Metadata Taxonomy Md-Tx	Architecture Viewpoints ^a Md-Sr	Metadata Connectivity Md-Cn	Metadata Processes ^a Md-Pr					Metadata Constraints ^a Md-Ct		Metadata Traceability Md-Tr
Str	rategic St	Strategic Taxonomy St-Tx	Strategic Structure St-Sr	Strategic Connectivity St-Cn		Strategic States St-St	-			Strategic Constraints St-Ct	Strategic Deployment, St-Rm Strategic Phasing St-Rm	Strategic Traceability St-Tr
Ope	rational 0p	Operational Taxonomy Op-Tx	Operational Structure Op-Sr	Operational Connectivity Op-Cn	Operational Processes Op-Pr	Operational States Op-St	Operational Interaction Scenarios Op-Is			Operational Constraints Op-Ct		
Se	ervices Sv	Service Taxonomy Sv-Tx	Service Structure Sv-Sr	Service Connectivity Sv-Cn	Service Processes Sv-Pr	Service States Sv-St	Service Interaction Scenarios Sv-Is	Conceptual Data Model,	Environment Pm-En	Service Constraints Sv-Ct	Service Roadmap Sv-Rm	Service Traceability Sv-Tr
Per	rsonnel Pr	Personnel Taxonomy Pr-Tx	Personnel Structure Pr-Sr	Personnel Connectivity Pr-Cn	Personnel Processes Pr-Pr	Personnel States Pr-St	Personnel Interaction Scenarios Pr-Is	Logical Data Model,		Competence, Drivers, Performance Pr-Ct	Personnel Availability, Personnel Evolution, Personnel Forecast Pr-Rm	Personnel Traceability Pr-Tr
Res	sources Rs	Resource Taxonomy Rs-Tx	Resource Structure Rs-Sr	Resource Connectivity Rs-Cn	Resource Processes Rs-Pr	Resource States Rs-St	Resource Interaction Scenarios Rs-Is	Physical schema, real world results	Measurements Pm-Me	Resource Constraints Rs-Ct	Resource evolution, Resource forecast Rs-Rm	Resource Traceability Rs-Tr
Se	curity Sc	Security Taxonomy Sc-Tx	Security Structure Sc-Sr	Security Connectivity Sc-Cn	Security Processes Sc-Pr					Security Constraints Sc-Ct		
Pr	ojects Pj	Project Taxonomy Pj-Tx	Project Structure Pj-Sr	Project Connectivity Pj-Cn	Project Activity					-	Project Roadmap Pj-Rm	Project Traceability Pj-Tr
Sta	ndards Sd	Standard Taxonomy Sd-Tx	Standards Structure Sd-Sr								Standards Roadmap Sr-Rm	Standards Traceability Sr-Tr
	ctuals sources Ar		Actual Resources Structure, Ar-Sr	Actual Resources Connectivity, Ar-Cn		Simulation ^b				Parametric Execution/ Evaluation ^b		
						Die	ctionary * Dc					
						Summary	y & Overview Sr	mOv				
						Req	uirements Rq	Require	ment Class			

How Does Systems Engineering Support these Frameworks?

- To answer this question, we need to step back and understand where these frameworks originally came from
- The main driver initially was to replace MIL-STD-499 with "architecture"
- A set of systems engineering diagrams formed the basis for the C4ISR Architecture Framework



Examples from C4ISR Architecture Framework

- A variety of examples were provided by the members of the working group
- These formats were the basis for many of the diagrams used throughout the DoDAF implementation
- Templates for each product (now called model) were derived from these types of diagrams

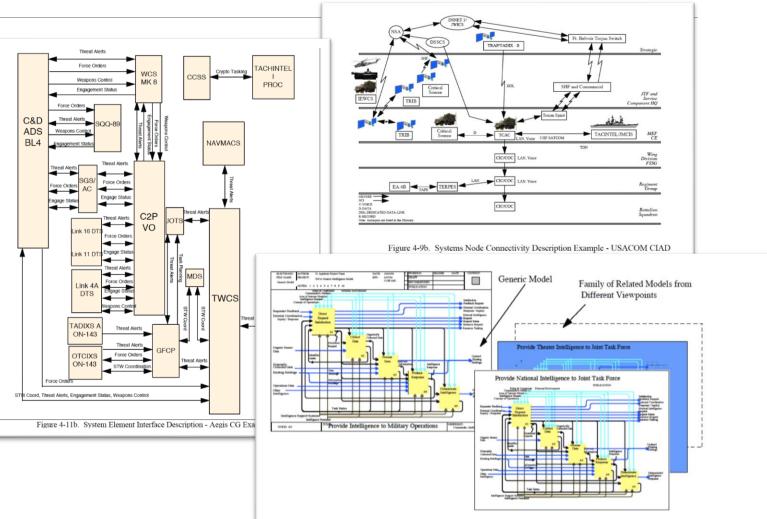


Figure 4-16a. Activity Model - Joint Task Force Intelligence Processes Example

How Can We Implement these Frameworks?

- The complexity of the Frameworks, as now described by OMG, means that we need to rely on tools to implement them
- It also means that using these Frameworks may force systems engineers to use their other standard: SysML
- Since SysML itself is a very complicated "language" that few outside the systems engineering community understand or accept, DoD should be cautious of this approach
- We (SPEC Innovations) have tried to implement these frameworks using the LML ontology, extended to not only DoDAF MetaModel 2.0 (those mappings were outlined in version 1.0 of the LML standard), but also to add entity classes, relationships and attributes (if required) for the UAF
- As a result we are providing a new DoDAF Dashboard capability in Innoslate 4.1

How Do We Implement these Frameworks?

- New DoDAF Dashboard
 - Similar to our Documents and Diagrams Views
- New Timeline Diagram
 - To enhance those views requiring a roadmap
- New OV-3/SvcV-6/SV-6
 View using our
 Database View
 technology

ENJ • ② Dashboard I Database of Diagrams O DoDAF				C New DoDAF Product	4 🗆 (
OV-4 Lat save 6 months apo Lat save 6 months apo O TST Organizations that protocold time sensitive target: CCONF Product OV-4 Cognization 1	OV-2 UV-2 UV-2 Last saved 8 minutes apo UV-2 Scott Participants (OV-2) UV-2 Scott Particip	OV-5a Last saved 0 minutes apo Scen 1 Scenaro 1. Detect, Locate, and Kill TEL (OV-56) Kdate, DabA/ Prodet, OV-56 OV-56, OV-66 Scenaro	OV-1	AV-1	
All Existing DoDAF Products			Show	ng All DoDAF Products Sorted by Number	
1-5 of 5 < >	OV-4	01/-1	0V-2	Find a DeDAF Product. Q 🍐	

How Do We Implement these Frameworks?

- These views can easily be extended to the UAF
- Development of a UAF dashboard will occur if sufficient user demand requires it
 - A mapping has already been made and implementation will be simple
- However, it seems unclear to us the value of this new framework
 - Adding complexity on complexity seems to us to be the wrong way to go
 - We need to establish clear, simple language so that anyone we work with can understand what we are trying to say
 - We believe that LML provides a much better approach (data-centric) with a simple and easy to understand ontology, as well as simplified diagrams

Summary

- Frameworks can have value, but only when they are implemented in a way anyone can understand
- We must always remember that as systems engineers our primary role is to act as the translator between all stakeholders
- If these frameworks aid in that goal, then they will have value
 - Obviously if they don't help communicate, then they are a detriment to all stakeholders